

NONINDIGENOUS PLANTS

Proceedings of the Workshop on Databases

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Gainesville, Florida
September 24-25, 1997

Cover: A popular garden plant, Chinese tallow tree, *Sapium sebiferum*, bears many fruit that are carried by birds and water runoff to invade natural areas. Ranging from Texas to Florida and expanding northward in the southeastern states, this aggressive nonindigenous plant can become the prominent component in habitats that vary from marshes to river margins to dry uplands. Photo by Larry Allain, USGS.

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The spread of nonindigenous plants threatens biological diversity and the functioning of natural ecosystems throughout the United States. It imposes land management problems and costs to both public and private sectors. Spatial information on these species, such as where they occur, how much land they cover, and their range of spread, is currently managed by an array of independent and dissociated databases. Distribution information is instrumental for preventing and managing the spread of introduced plants.

The Workshop on Databases for Nonindigenous Plants was organized in response to a need suggested by the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW) to identify and pull together Federal and non-Federal programs involved in managing distribution data on nonindigenous plants. Twenty-two scientists and data managers assembled to present their programs and to discuss topics associated with the management of occurrence data. It is hoped that this gathering and associated catalog of databases may help promote interagency coordination in an effort to determine and track the expanding distribution of introduced plants.

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By

Colette C. Jacono and Charles P. Boydstun

U.S. Department of the Interior
U.S. Geological Survey
Biological Resources Division

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**Proceedings of the Workshop on Databases for
Nonindigenous Plants
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September 24-25, 1997**

By

Colette C. Jacono

and

Charles P. Boydstun

*Nonindigenous Aquatic Species Program
U.S. Geological Survey
Biological Resources Division
Florida Caribbean Science Center*

The workshop was presented by the Nonindigenous Aquatic Species Program of the U.S. Geological Survey's Biological Resources Division in Gainesville, Florida. Additional financial support was provided by the National Biological Information Infrastructure (NBII) program and publishing support by the National Wetlands Research Center, both also within the U.S. Geological Survey's Biological Resources Division.

Abstract: The spread of nonindigenous plants threatens biological diversity and the functioning of natural ecosystems throughout the United States. It imposes land management problems and costs to both public and private sectors. Spatial information on these species, such as where they occur, how much land they cover, and their range of spread is currently managed by an array of independent and disassociated databases. Distribution information is instrumental for preventing and managing the spread of introduced plants.

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List of Acronyms

AEC	Army Environmental Center	HEAR	Hawaiian Ecosystems at Risk Project
ANSTF	Aquatic Nuisance Species Task Force	IAS	Invasive Alien Species
APHIS	Animal and Plant Health Inspection Service	ICBI	Interagency Center for Biological Invasions
APIRS	Aquatic Plant Information Retrieval System	MAB	Man and the Biosphere
BCD	Biological Conservation Database of the Florida Natural Areas Inventory	NAPIS	National Agricultural Pest Information System
BEN	Botanical Electronic Newsletter	NBII	National Biological Information Infrastructure
BLM	Bureau of Land Management	NIS	Nonnative Invasive Species
BONAP	Biota of North America Program	NPDC	National Plant Data Center
BRD	Biological Resources Division	NPS	National Park Service
CAPS	Cooperative Agricultural Pest Survey	NRCS	Natural Resources Conservation Service
CPFS	Colorado Plateau Field Station	NRMAP	Natural Resource Management and Assessment Program
DOD	Department of Defense	NWIS	Noxious Weed Information System
FGDC	Federal Geographic Data Center	OTA	Office of Technology Assessment
FHM	Forest Health Monitoring Program	UDOT	Utah Department of Transportation
FICMNEW	Federal Interagency Committee for the Management of Noxious and Exotic Weeds	USACE	United States Army Corps of Engineers
FLEPPC	Florida Exotic Pest Plant Council	USDA	United States Department of Agriculture
FNAI	Florida Natural Areas Inventory	USFS	United States Forest Service
GILS	Global Information Locator Service	USGS	United States Geological Survey
GIS	Geographic Information System	WES	Waterways Experiment Station

Introduction

The workshop brought together a unique group interested in documenting, tracking, and monitoring the spread of nonindigenous plants. The workshop focused on developing a clearer picture of how databases are being or could be used to document the range and spread of nonindigenous plant populations across the nation. Additionally, it highlighted the importance of needed interagency tools for exchanging information and how information exchange might improve the ability to better document and track these species. By providing a forum to present and discuss databases, an initial step was taken in improving recognition and communication among data managers. The workshop also resulted in a survey and inventory of databases to be used as a resource for administrators and data managers.

Workshop Objectives

The workshop was intended to identify and develop an understanding of programs focused on managing spatial data on nonindigenous plant species. The primary objectives were:

- Identify and describe current and planned programs that manage occurrence inventories or monitor distribution of nonindigenous plants.
- Provide a summary and catalog of databases by identifying important properties, such as program purpose and specialty, biological and geographical coverage, data elements, software and formatting components, and accessibility of data sets.
- Identify strategies for making data more accessible and improving interprogram coordination and data exchange.

Background on Nonindigenous Species Issues

The workshop opened with a history of the Federal focus on nonindigenous species issues. The following excerpt serves to place these issues in context with the workshop.

Invasive Alien Species: an Emerging National Environmental Issue

by

William P. Gregg, Jr.

Scientists, agriculturalists, and natural resource managers have long recognized the introduction and spread of invasive alien species (IAS) as important environmental problems. The problems have yet to become a national environmental issue, commanding priority emphasis on both policy and technical levels. However, recent initiatives are focusing unprecedented national attention on IAS, which now seems certain to become a major environmental issue as the millennium approaches.

Serious efforts to address the issue at the national level date from 1990, when the Congress created the interagency Aquatic Nuisance Species Task Force (ANSTF) to develop a coordinated program to address the introduction and spread of invasive species in the nation's waterways. The Task Force has increased public awareness of the issue and fostered significant cooperation and pooling of resources, especially in areas under the greatest threats, such as the Great Lakes.

In 1993, the Office of Technology Assessment (OTA) published a landmark report on harmful nonindigenous species—the most comprehensive review ever undertaken by our national government. The report left no doubt regarding the magnitude of the threats and the need for enlightened policies, reliable information, and adequate resources to deal with the problem.

In 1994, 17 Federal agencies and bureaus signed a memorandum of understanding establishing the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW). Like ANSTF, FICMNEW provides a forum for identifying problems; recommending policy and management practices; identifying needs for research, technology transfer, and public education; and fostering partnerships with state and local governments and the private sector for pooling resources. In April 1997, FICMNEW released the National Strategy for Invasive Plant

Management, with a roster of more than 100 supporting organizations. The strategy sets forth national goals and objectives for preventing new introductions, controlling or eradicating species already causing significant problems, and restoring degraded ecosystems.

International efforts to address the problem also are increasing. For example, the Convention on Biodiversity, which entered into force in 1992, calls on parties to prevent the introduction of alien species and to control or eradicate alien species that threaten ecosystems, habitats, or species. The convention provided the catalyst for the first major international conference on alien species, which was convened by the Norwegian government and various United Nations agencies in 1996. The conference highlighted the implications of IAS in conservation, sustainable development, and world trade and has helped promote increasing international discussion, particularly regarding ways to control pathways for the spread of IAS.

In May 1997, Vice President Al Gore, in response to a request from Congressional leaders and a letter signed by more than 500 concerned scientists, directed key Federal agencies (Departments of Agriculture, Commerce, and the Interior) to make recommendations for a coordinated attack on the problem. The agencies' response (now being developed) calls for an integrated campaign against invasive alien species, combining prevention, early detection, control of established IAS, and restoration of affected areas, and establishing IAS as a major national environmental issue. A core recommendation is expected to call for the development of a coordinated national information system to provide electronic access to domestic and international sources of data and information on IAS. The information system would enable users to integrate data and information from many sources to characterize problems, assess threats, identify research needs, and develop effective management and control actions. The 1993 OTA report stated flatly that:

Although much information on NIS [non-native invasive species] exists, overall it is widely scattered, sometimes obscure, and highly variable in quality and scientific rigor. No governmental or private agency keeps track of new NIS that enter or become established in the country, unless they are also considered a potential pest to agriculture or forestry, or a human health threat, and even those databases are not comprehensive. Summary lists of NIS do not exist for most types of organisms. The gap is especially large for nonindigenous insect and plant species, which number in the thousands in the United States . . . Even for known NIS, the effects of many have never been studied, especially those without clear economic or human health impacts. Information on effects is similarly lacking for the numerous as-yet-undetected NIS that [are believed] to be already established in the country (U.S. Congress Office of Technology Assessment. 1993. Harmful nonindigenous species of the United States. OTA-F-565. U.S. Government Printing Office, Washington, DC).

The database programs that are the focus of this workshop are evidence that OTA's assessment is becoming out of date. Progress is being made in using databases to document records of nonnative species and monitor current distributions. The workshop brings together, for the first time, the managers of many of the most significant databases, which contain taxonomic data; data from museum collections, protected areas, and biosphere reserves; and data from national, state, and regional surveys and monitoring. The workshop's purposes are to provide a preliminary documentation of these databases and to initiate cooperation and communication among IAS database managers in the United States. By facilitating discussion of databases developed for various taxa, geographic regions, and institutional objectives, the workshop should help foster appropriate

standardization of data collection, reporting, and management as well as encourage the contributions of a community of specialists and the pooling of agency resources in developing a coordinated IAS information system.

As no country yet has a coordinated framework for managing and distributing occurrence records for IAS, this workshop also provides an opportunity to communicate U.S. experience and accomplishments in documenting the occurrence and spread of IAS. It is an important step toward U.S. leadership on a global issue in which the United States has a vital interest. With more biomes than any other country and comparatively intact natural ecosystems, the United States is particularly at risk from invasive alien species, and thus has particular incentive for improving the availability of reliable data on IAS.

International Affairs Officer
USGS
BRD
Reston, Virginia

Workshop Highlights

Presentations

The workshop provided a forum for introduction to and description of participating database programs. Attendees presented their database descriptions in a seminar format. The 2 day workshop consisted of a series of these presentations followed by open discussion periods which focused on the previously distributed discussion questions. The schedule of presentations is listed below.

Wednesday, September 24

Russ Hall, USGS Biological Resources Division:
Welcome and Opening Address

William Gregg, USGS Biological Resources
Division: Nonnative Invasive Species: an Emerging National Environmental Issue

Mark Skinner, USDA/NRCS/NPDC: Informational Activities of NRCS Regarding Noxious Weeds

Al Cofrancesco, DOD/USACE: Army Lands Inventory

David McNeal, USDA/APHIS: National Agricultural Pest Information System Database

Carol Spurrier, BLM: Interests in Tracking Nonindigenous Plants

Kathryn Thomas, USGS Biological Resources
Division: The Exotics Map Project for the 4-Corners of the Southwest

Joe Gregson, NPS: NRMAP and NPFLORA Databases

Ken Stolte, USDA Forest Service: Forest Health Monitoring Program

Christopher Toney, University of Montana: INVADEERS Database Project

Patrick Akers, California Department of Food and Agriculture: Noxious Weed Inventory System

Joe Dineen, Smithsonian Research Center:
Nonindigenous Species Database for the Chesapeake Bay (a brief overview)

Levester Pendergrass, USDA Forest Service: Forest Service Noxious/Invasive Database (a brief overview)

Pam Fuller, USGS Biological Resources Division:
National Nonindigenous Aquatic Species Database

Thursday, September 25

John Kartesz, Biota of North America Program:
Digital Synthesis for Assessing Exotic and Weed Plant Distributions for North America

Philip Thomas, USGS Biological Resources
Division: Alien Species Databases of the Hawaiian Ecosystems at Risk Project

Victor Ramey, University of Florida: Aquatic and Wetland Plant Information Retrieval System

Tom Stohlgren, USGS Biological Resources
Division: Multi-Scale Patterns of Native and Exotic Plant Diversity

Both discussion sessions were moderated by Randy Westbrook, USDA/APHIS.

Technical Discussion Sessions

Five questions designed to stimulate discussion of the workshop objectives were initially presented within the pre-workshop information survey.

At the workshop, the first discussion sessions began with the moderator's request to:

- 1) Ensure databases are accessible.
- 2) Place a high priority on early detection and record management.
- 3) Coordinate and interact in reporting new records for a first alert detection system.

The session continued with an examination of the questions that were presented on the preworkshop survey form. Summaries of both the written comments and verbal discussions stimulated by the questions are provided below.

Question 1: What are your comments and/or recommendations on the need of a national database for monitoring the distribution of nonindigenous plants?

Several individuals supported the idea of a national database and expressed different reasons for supporting such a program. Responses were as follows:

- Nothing less than a national approach could provide the information needed on the large geographical scale that nonindigenous plants invade.
- A national database could be useful in providing standards for table structure and nomenclature that could be used by individual databases.
- A useful database could be one that specifically tracks the land area covered nationwide by nonindigenous plants. This might be especially important for land managers who need to assess precise numbers of infested acreage in order to support funding requests.

The remaining respondents supported the need for smaller, more local databases. A synopsis of comments are as follows:

- Large databases are expensive and difficult for users in the field.
- A national, nonindigenous database would duplicate current or planned systems.

- Emphasis should be on smaller, local databases designed with common elements so that data can be easily shared.

Overall, only mild interest was expressed in directly addressing the need for a national database to manage records on the spatial distribution of all nonindigenous plants. Additional relevant comments included:

- The observation that all Federal databases would be required to follow Government Information Locator Service (GILS) standards, core metadata information, and other keywords.
- To create the baseline for such a database, requests from all currently existing databases would need to be made, with the minimum information provided in a batch mode.
- Additional resources would need to be pooled to prevent duplication of effort.

It was generally indicated that any suggestions made towards a national database would be towards the early detection/web site reporting format. Participants discussed an early detection system composed of reporting, verifying, and listing that would provide up-to-date occurrence information on new plant introductions. Participants suggested that this system would be most accessible through an interactive Internet web site. Such a web site could include an electronic reporting form and up-to-date listings. The reporting form would be supported by a minimal database, essential for compiling records. Records would be listed at the web site immediately after completion of proper assessment and verification. It was suggested that one full-time employee would be needed to verify incoming reports.

Participants were reminded of the current system within the National Agricultural Pest Information System (NAPIS) that is used for documenting records of newly introduced species. It was noted that NAPIS provides \$350,000 annually per state to support this system and that existing state survey committees might easily interface with some of the networking structures just suggested. It was made clear that the Animal and Plant Health Inspection Service (APHIS) has the responsibility and obligation to report all introductions of new species, regardless of their listing or status.

Questions were raised as to how the general public could access the NAPIS system, currently available through a system account. Concerns were raised as to whether APHIS allocates adequate funding for plants in the NAPIS system and if NAPIS has the resources to adequately report on the predicted increase in the number of new plant records. It was noted that NAPIS is forming a new Pest Advisory group that is expected to be able to handle an increase in reports.

The Biota of North America Program (BONAP) and U.S. Department of Agriculture (USDA)/National

Resources Conservation Service (NRCS)/National Plant Data Center (NPDC) also expressed their interest in participating in an early detection and web site reporting program. FICMNEW, the Bioinformatics Task Team within NBII, the PLANTS program, and the proposed "National Interagency Center For Nonindigenous Species" were suggested as appropriate places to house such a project and/or maintain an early detection web site.

It was stressed by participants that the success of the system would depend on the timely assessment, verification, and on-line listing of new introductions. "Getting the word out to those on the ground," to land managers, database managers, and weed teams was an important issue. The documentation of proper credit for those professionals who report on initial discoveries or submit important records was recognized as an important concern.

Question 2: What resources (funding, technical, institutional) would be required to make such a database possible?

Valid monitoring data is crucial to establishing, maintaining, and applying an occurrence database. It was agreed that collection of occurrence data on nonindigenous plants is lacking and needs to be increased. It was noted that Native Plant Societies could play a role in early detection by informing amateur botanists what species to look out for and how to identify nonindigenous plants.

Promotion of the discussed early reporting system was recognized as an important factor. Also recognized was the need to consult with current working groups, including the Botanical Electronic Newsletter (BEN) and the Interagency Center for Biological Invasions (ICBI), as well as with experts in early detection systems.

Question 3: What elements should be included in a distribution database for nonindigenous plants?

It was stressed that the database used to process new reports for the early detection web site should be minimal in structure. Those interested in acquiring more information on individual reports would be directed to the agency, individual, or database affiliated with the report. Six elements were defined for the basic structure:

- 1) Standardized nomenclature
- 2) County level spatial reference
- 3) Collection date
- 4) Collector name and affiliation
- 5) Source of information (agency or database affiliated with the report)
- 6) Source's reference number (i.e., record number in another database).

Also suggested was that the web site clearly define appropriate reports. Appropriate reports might include any species recorded as newly introduced to a state as well as any species newly introduced to the county.

Recognizing the likelihood that general reporting often will not originate from vouchered plant specimens, it was recommended that every record be verified with a documented specimen voucher.

Question 4: How might your agency/organization support a national database (i.e., contribute occurrence records, taxonomic support, web site linkages)?

A strong display of cooperation was evident from both written and verbal responses to this question. Database managers made generous offers to share occurrence records. Additional offers of support were made in the format of Internet distribution and web site linkages, taxonomic expertise, quality control, and technical expertise in software development for database creation and use.

Some participants mentioned that they routinely send new reports to APHIS, and the APHIS representative agreed to contribute to the discussed format.

Question 5: If there were to be a larger workshop on distribution databases for nonindigenous plants, who should conduct it, who should attend, and what issues should be addressed?

Several written responses indicated the need to conduct a larger workshop. It was suggested that the coordination of a "National Information System on Nonnative Species" is needed. And that such a system ought to have both Washington level program managers and information/database managers present in order to finalize a workable strategy.

Indeed, it was repeated at the workshop that any future meeting should not only include agency heads, but ought to require their commitment. It was suggested that the attendance of representatives from the agricultural, ranching, and horticultural industries would be beneficial. It was acknowledged that in the event of a similar gathering, all agencies and organizations should be present to portray their interests and scope.

Further discussion addressed the horticultural sector's responsibilities as initiators of new introductions. It was requested that botanical gardens make their introduction records more accessible through the Internet.

Although it was recognized that additional issues about databases need to be discussed, participants did not express a desire to commit to a subsequent workshop.

As an intermediate measure, the creation of a listserver was recommended. An offer was made to create a listserver in order to continue communication and development of ideas on managing occurrence records and information on nonindigenous plants.

Also recommended was the initiation of a Nonindigenous Plant Database Working Group Web site. This web site would provide program descriptions, contact numbers, and hypertext links to all databases with information on nonindigenous plants.

Information Survey and Catalog of Distribution Databases for Nonindigenous Plants

To gather information for the inventory of databases, database managers responded to a questionnaire issued by the workshop organizers. Seventeen different programs responded to the survey.

Database managers identified the purpose, status, and intended user of their database. The availability of Federal Geographic Data Committee (FGDC) metadata was addressed. Formats for accessing the data were described. How data are structured and what software is used was indicated. Categories were provided to describe the source of occurrence data: field data collected as part of the database program, field data collected by an independent program, herbarium data, literature based data, or personal communications. Responses reflected the time frame the data represents, as well as how it may be geographically or politically referenced. The geographical extent, land ownership, and type of land cover from which occurrence data is derived was described. Categories were also chosen to indicate the type of plants as well as other nonindigenous organisms treated. Current products and planned additions to the program were listed. Finally, characteristic data elements were outlined and nomenclature sources cited.

These responses were then compiled into two tables to facilitate comparison of important features among them and to serve as a simple reference. In addition, a synopsis of the various database inventories and characteristics follows tables 1 and 2.

Table 1. Available Federal databases on the distribution of nonindigenous plants.

Federal databases									
	DOD, USACE	NPS	USDA, FS	USDA, FS	USDA, APHIS	USDA, NRCS	USGS, BRD	USGS, BRD	USGS, BRD
Database manager	A. Cofrancesco 601/634-3182	B. Commings 202/208-4631	R. Beard 970/498-1715	C. Liff 702/798-2222	D. McNeal 301/734-8247	M. Skinner 504/775-6280	P. Thomas 808/572-9306 (x53233)	C. Boydston 352/378-8181	K. Thomas 520/556-7466
Database title	Army Lands Inventory	Natural Resources Management and Assessment Pro- gram	Forest Service Noxious/Invasive Database	Forest Health Monitoring Program	National/Agricultural Pest Information System	The Plants Database	Alien Species Databases of the HEAR Project	Nonindigenous Aquatic Species Program	The Exotics Map Database
Purpose	Conduct inventory and develop data- base on noxious and nuisance plants on Army lands	Relate data on natural resources to personnel needs for re- source manage- ment at NPS units	Relate and graphically dis- play data on administrative reporting, inven- tory, and biologi- cal control for use in field offices	Annually monitor and report on conditions, changes, and trends in U.S. forests for sustainability	Provide survey data for plant pests in the United States	Provide information for natural resource conservation for NRCS, its clients, cooperators, and the public	Provide resources to natural resource managers in Hawaii to aid fight against alien species state- wide	Document status and distribution of nonindigenous species introduced to U.S. waters	Use Internet mapserver technology to help land mana- gers integrate exotic plant man- agement in the arid Southwest
Status									
Initiating	X								
Ongoing		X	X	X	X	X	X	X	X
Complete			X						
Plants treated									
Noxious only	X								X
Invasive only								X	
All nonindigenous									
Rare/endangered		X	X	X	X	X	X		
All plants									
Other nonindigenous organisms treated									
Vertebrates - terres		X					X	X	
Vertebrates - freshw		X					X	X	
Vertebrates - marine		X						X	
Invertebrates - terres					X		X	X	
Invertebrates - freshw							X	X	
Invertebrates - marine							X	X	
Pathogens/parasites					X		X	X	
Geographic extent									
International				X					
National		X	X		X	X	X	X	X
Regional	X								
State							X		
Intended user									
Land managers	X	X	X	X	X	X	X	X	X
Researchers	X	X	X	X	X	X	X	X	X
Public				X			X	X	X
Dates data represents	1997	1993-1996	1983-present	1990-present	1900-present	1795-present	historical to present	1850-present	1996-1997
Data sources									
In-house monitoring	X	X	X	X	X	X	X	X	X
Outside monitoring	X	X	X	X	X	X	X	X	X
Herbarium records	X		X	X	X	X	X	X	X
Literature	X		X	X	X	X	X	X	X

Federal databases									
	DOD, USACE	NPS	USDA, FS	USDA, FS	USDA, APHIS	USDA, NRCS	USGS, BRD	USGS, BRD	USGS, BRD
Personal communi- cations	X	X		X			X	X	
Data Referencing Point			X	X	X		X	X	X
Locality	X	X	X	X	X		X	X	X
Geographic feature - feature listed		X	X	X			X	X	X
		management unit	management unit, watershed, Bailey's ecoregions	forest type, etc			island	hydrologic unit	rivers, roads
Political feature	X	X	X	X	X	X	X	X	X
- township			X	X					
- county			X	X	X	X	X	X	
- state			X	X	X	X	X	X	X
- other		National Park unit	forest district, weed management area				island		administrative
Land ownership									
Federal	X	X	X	X	X	X	X	X	X
Tribal					X				X
State		X	X	X	X	X	X	X	X
County			X	X	X	X	X	X	X
City			X	X	X	X	X	X	X
Private		X	X	X	X	X	X	X	X
Land cover									
Western forests	X	X	X	X		X			
Alpine tundra		X	X	X	X	X			
Barren		X	X	X	X	X			
Shrublands	X	X	X	X	X	X			X
Grasslands	X	X	X	X	X	X			X
Croplands	X	X	X	X	X	X			
Eastern forests	X	X	X	X	X	X			
Freshwater wetlands	X	X	X	X	X	X		X	
Coastal wetlands		X	X	X	X	X		X	
Open water		X	X	X	X	X		X	
Other				tropical forests				coastal waters	
Metadata			X	X		X		X	
Data availability		X			X		X	X	X
Digital media		dBASE IV			ASCII			ARC/INFO export, dBASE, ASCII	dBASE, Para- dox
File exchange format		none			none		cost of media	none	none
Digital media cost									
Online web site					X	X	X	X	X
Hard copy	X		X	X	X	X	X	X	X
Hard copy cost	none		none	varies	none	none	none	none	
Data structure									
Spatial (GIS)			X	X	X	X	X	X	X
Relational database		X	X	X	X	X	X	X	X
Spreadsheet	X								

Table 1. Continued.

Federal databases									
Data management software	DOD, USACE	NPS	USDA, FS		USDA, APHIS	USDA, NRCS	USGS, BRD	USGS, BRD	USGS, BRD
			Oracle, ARC/INFO	Oracle					
Access		NRMAT (under revision)	Oracle, ARC/INFO	Oracle	Adabase	Oracle, Informix, Access	Paradox for Windows	ARC/INFO, CA-Openingres RDBMS	Visual Foxpro, ARC/INFO, ARC/View
Products									
Maps			X	X	X	X	X	X	X
Graphics			X	X	X	X	X	X	X
Reports	X		X	X	X	X	X	X	X
Factsheets			X	X	X	X	X	X	X
Images			X	X	X	X	X	X	X
Other						X	models: climate, invasiveness, veg. monitoring		
Information system									
monitoring information system									
Additions planned									
Extent cover		X			X		X		
Land cover		X			X		X		
Plant species		X			X		X		
Other organisms		X			X		X		
GIS		X			X		X		
Field data collection		X			X		X		
Online web site		X			X		X		
Other additions		X			X		X		
Typical data elements									
Taxonomy				X		X	X	X	X
Scientific name	X			X		X	X	X	X
Common name		X		X		X	X	X	X
Origin		X		X		X	X	X	X
Legal status									
Life/growth form									
Duration									
Area/abundance	X	X		X		X	X	X	X
Plant associates				X		X	X	X	X
Habitat				X		X	X	X	X
Management/control	X	X		X		X	X	X	X
Identification									
Nomenclature source*									
			USDA/NRCS 1998	Weed Science Society of America, ca 1989	USDA/NRCS 1998; BONAP	Imada et al. 1989; others as documented	USDA/NRCS 1998; Reed, 1988 (common names)		

*Biota of North America Program (BONAP), North Carolina Botanical Garden of the University of North Carolina at Chapel Hill, Chapel Hill, NC.

Imada, C.T., W.L. Wagner, and D.R. Herbst. 1989. Checklist of the native and naturalized flowering plants of Hawaii. Bishop Museum Occasional Paper 29:31-87. The State Museum of Natural and Cultural History, Honolulu, HI. Compiled into an on-line checklist by Loyal Mehrhoff, updated with records of the Hawaii Biological Survey for 1994 (Bishop Museum Occasional Paper Nos. 41 and 42) and for 1995 (Bishop Museum Occasional Paper 46). 12 March 1996. <<http://www.bishop.hawaii.org>>.

Reed, P.B., Jr. 1988. National list of plant species that occur in wetlands: national summary. U.S. Fish and Wildlife Service Biological Report 88 (24).

USDA, NRCS. 1998. The PLANTS database. <<http://plants.usda.gov>>. National Plant Data Center, Baton Rouge, LA. Version: 2 January 1998.

Weed Science Society of America. 1989. Composite List of Weeds. Weed Science Society of America, Champaign, IL.

Table 2. Available non-Federal databases on the distribution of nonindigenous plants.

	State			Academic Institutions		Nongovernment Organizations		
	Calif. Dep. of Food & Agric.	Montana Dep. of Agric.	Utah Dep. of Transport.	BONAP	Univ. of Calif., Davis	FLEPPC	The Nature Conservancy	FNAI
Database manager	P. Akers 916/654-0768	P.M. Rice 406/243-2671	I. Bickford 801/965-4119	J. Kartesz 919/962-0578	R.J. Meese 916/752-1768	G. Julinsky 850/539-9681	B. Meyers-Rice 530/754-8891	L. Peterson 850/224-8207
Database title	Noxious Weed Information System	INVADERS Data-base Project	ROADVEG	Biota of North America Program	MA Flora	Fla. EPPC Invasive Plant Database	Exotic Species Database	Florida Natural Areas Inventory
Purpose	Use FTP exchange and Map-Info GIS to help Calif. field biologists inventory noxious weed infestations and track eradication	Source of distribution records for exotic and weedy native plants in the northwest states	Database encoding land and vegetation attributes for roadsides, adjacent lands, and context landscapes	Develop unified system for assessing North American biota; use Digital Floristic Synthesis for assessing exotic and weed plant distributions	Computer program provides interface for biologists to input occurrence records and create reports on MAB Reserves	Capture location of invasive exotic plants in Florida to document impacts, identify habitat and research needs, and justify policy and control strategies	Assess weed problems on preserves stewarded by The Nature Conservancy and formulate control strategies	Track information on species, managed areas and conservation areas in Florida
Status								
Initiating	X	X	X	X	X	X	X	X
Ongoing								
Complete				X				
Plants treated								
Noxious only	X							
Invasive only						X		
All nonindigenous		X					X	
Rare/endangered								X
All plants			X	X	X			
Other nonindigenous organisms treated								
Vertebrates - terres				X	X			
Vertebrates - freshw				X	X			
Vertebrates - marine				X	X			
Invertebrates - terres								
Invertebrates - freshw								
Invertebrates - marine								
Pathogens/parasites								
Geographic extent								
International				X	X		X	X
National								
Regional		X				X		
State	X		X					
Intended user								
Land managers	X	X	X	X	X	X	X	X
Researchers		X		X	X	X		
Public	X			X		X		
Dates data represents	1997	1875-present	1996-present	1700's-present	1950-present	1995-present	1992, 1995	1900-present
Data sources								
In-house monitoring	X		X	X		X	X	X
Outside monitoring	X			X	X	X		X
Herbarium records		X	X	X	X			X
Literature		X	X	X	X			X
Personal communications	X			X	X		X	X

Table 2. Continued.

	State			Academic Institutions			Nongovernment Organizations		
	Calif. Dep. of Food & Agric.	Montana Dep. of Agric.	Utah Dep. of Transport.	BONAP	Univ. of Calif., Davis		FLEPPC	The Nature Conservancy	FNAI
Data referencing									
Point		X		X				X	X
Locality	X	X		X	X		X	X	X
Geographic feature			X	X					X
-feature listed			route, milepost	watershed	management unit, protected area				management unit, watershed
Political feature	X	X	X	X	X		X		X
-township	X	X	X	X			X		X
-county	X	X	X	X			X		X
-state	X	X	X	X	X		X		X
-other					parks			land preserves	conservation sites
Land ownership									
Federal	X	X		X	X		X	X	X
Tribal									
State	X	X		X	X		X		X
County	X	X	X	X			X		X
City	X	X	X				X		X
Private	X	X	X		X		X		X
Land cover									
Western forests	X	X	X	X	X			X	
Alpine tundra		X		X	X			X	
Barren		X	X	X	X		X	X	X
Shrublands	X	X	X	X	X		X	X	X
Grasslands	X	X	X	X	X		X	X	X
Croplands	X	X	X	X	X		X	X	X
Eastern forests	X	X	X	X	X		X	X	X
Freshwater wetlands	X	X	X	X	X		X	X	X
Coastal wetlands	X	X		X	X		X	X	X
Open water	X	X		X	X		X	X	X
Other									
Metadata	X				X				
Data availability									
Digital media		X	X	X	X				X
File exchange format			dBASE, Paradox	ArcView	customized per request		dBASE		ASCII, dBASE
Digital media cost		\$80	none	varies	none			for TNC only	varies
Online web site				X	X				
Hard copy				X	X		X		X
Hard copy cost				varies	none		none		varies
Data structure									
Spatial (GIS)		X	X	X	X			X	X
Relational database	X	X	X						
Spreadsheet							X		
Data management software									
Access, Visual Basic		Paradox and custom software	ArcView	Paradox 8	FoxPro			MS Access	Advanced Revelations
Products									
Maps	X	X	X	X			X		X
Graphics		X	X	X					

Table 2. Continued.

	State		Academic Institutions		Nongovernment Organizations		
	Calif. Dep. of Food & Agric.	Montana Dep. of Agric.	Utah Dep. of Transport.	BONAP	Univ. of Calif., Davis	FLEPPC	The Nature Conservancy FNAI
Reports	X	X	X	X	X	X	X
Fact sheets							
Images							
Other							
Additional planned							
Extent cover							
Land cover							
Plant species				X			X
Other organisms				X	X		
GIS				X			
Field data collection				X			
Online web site				X			
Other additions	X	X	X	X	X	X	1998 update
ownership							
Typical data elements							
Taxonomy	X	X		X	X		X
Scientific name	X	X	X	X	X	X	X
Common name	X	X	X	X	X	X	X
Origin	X	X	X	X	X		
Legal status	X	X	X	X	X		X
Life/growth form	X	X	X	X	X	X	X
Duration	X	X	X	X	X	X	X
Area/abundance	X			X	X	X	X
Plant associates			X		X	X	
Habitat	X	X		X	X	X	X
Management/control	X				X	X	X
Identification	X	X		X			
Nomenclature Source*	Hitchcock and Cronquist 1973, others			Kartesz 1997	USDA/NRCS 1998 (modified)		Kartesz 1994

*Hitchcock, C.L., and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, WA.
 Kartesz, J.T. 1994. A synonymized checklist of the vascular flora of the United States, Canada, and Greenland. Timber Press, Portland, OR.
 Kartesz, J.T. 1997. Digital floristic synthesis: the lexicon. Patricia Ledlie Booksellers, Inc., Buckfield, ME.
 USDA, NRCS. 1998. The PLANTS database. <<http://plants.usda.gov>>. National Plant Data Center, Baton Rouge, LA. Version: 2 January 1998.

Plants treated:

About half of the databases cover nonindigenous plants, exclusively. The remaining include all plants, native as well as introduced. Database design and content are tied to programmatic elements so that in some programs, the inclusion of nonindigenous plants is occasional or indirect.

Other organisms treated:

Nonindigenous organisms other than plants are covered by four of the Federal and by both university databases. Vertebrate animals and biocontrol agents are more commonly tracked.

Intended user:

All databases are intended for use by land managers, although some appear more oriented towards researchers or for the purpose of educating the general public.

Geographic extent:

The geographical extent of the 17 databases range from the state to international level. Nine programs cover distribution across the United States. Land ownership is not usually an issue for many programs with respect to collecting data or compiling distribution data. Combined databases collect or compile data from all USGS land cover types, although freshwater wetlands, grasslands, and shrublands are more commonly inventoried.

Data sources:

All except one program use occurrence data from outside sources. Literature, herbarium records, outside monitoring programs, and personal communications are all used. In some ways, these databases act as centers or clearing houses where outside data is analyzed and compiled for determination of distribution. However, 12 of the database managers responded that they also conduct some type of in-house monitoring program. Only about eight depend primarily on field data from their own monitoring programs for determining distribution.

Data referencing:

Knowing how data is referenced, or the geographic level at which data is used provides insight into the resolution at which actual spatial tracking occurs. Occurrence data within the databases are commonly referenced according to locality. Over half of the programs incorporate point data (latitude/longitude readings). Occurrence data is also often referenced according to geographical features such as rivers, watersheds, islands and forests, or ecoregion type. State and county are the most commonly referenced political features. Other political boundaries range from military installations and national park units, to administrative units such as management areas, preserves, and conservation sites.

Data dates:

The databases are mostly made of contemporary records, especially since 1980. Many programs include

historical data, and the oldest data actually date back to the 1700s.

Metadata:

Less than half of the databases have Federal Geographic Data Committee (FGDC) metadata.

Data structure:

Most are relational databases, although spreadsheets are still used.

Products:

The tables show that the databases are used for preparing reports (especially those applied to land management), maps, and other graphics. Analysis, modeling, and some unique monitoring information systems also result from these databases.

Data availability:

Over half of the databases have on-line web sites planned, the others currently use the Internet for providing access to data.

Planned additions:

Common additions planned include the Geographic Information System (GIS), collection of field data, and the addition of images and identification aids.

Database Abstracts:

Abstracts provide further description, contact numbers, and information on the database programs and on the status of data availability. Database directors and managers are gratefully acknowledged for answering the information survey and for providing abstracts upon request. An additional program, the Aquatic and Wetland Plant Bibliographic database, is included: although not a distribution database, it contains citations for a great deal of literature, including geographical accounts on nonindigenous aquatic and wetland plants.

Source and descriptive information on nonindigenous plant data programs is currently in demand. Indeed, knowledge of these databases is necessary for improving interagency coordination in the effort against nonindigenous plants. Knowledge of elements that are useful to others can help data managers determine beneficial elements for their own program.

While the emphasis of this report was initially on identifying databases within federal agencies, many exemplary programs were also discovered at state agencies, universities, and nongovernment organizations. The 18 databases noted in this report are the results only of an initial search. In light of FICMNEW's interest in the management of nonindigenous plants and their interest in a national system for storing and disseminating information about weed occurrences (Federal Interagency Committee on Noxious and Exotic Weeds (FICMNEW). 1997. Pulling Together: National Strategy for Invasive Plant Management, U.S. Government Printing Office. 22 pp.), it is suggested that the inventory of these types of databases continue.

Abstracts and Contacts for Distribution Databases Surveyed

Database title: **Army Lands Inventory**

Agency/Organization: Department of Defense (DOD), U.S. Army Corps of Engineers (USACE)

Purpose: Conduct inventory and develop a database on noxious and nuisance plants on Army lands.

Abstract: Because there is no central database on nonindigenous plant species on Army installations, the Waterways Experiment Station (WES) was tasked by the Army Environmental Center (AEC) to develop a database covering noxious and nuisance plants. There are a few databases that exist that identify the composition of vegetation at some military installations; however, these systems were developed to account for threatened and endangered species or for management of lands that have been disturbed during training operations. A questionnaire was developed to solicit information on the problem vegetation and the control methods utilized. Personnel at army installations nationwide are being asked to complete the questionnaire. In addition, another project funded by AEC will develop an information system that presents each state noxious weed and seed laws and the vegetation identified in these laws.

Database manager:

Al Cofrancesco

U.S. Army Corps of Engineers

Waterways Experiment Station

CEWES-ER-A

3909 Halls Ferry Road

Vicksburg, MS 39180-6199

Telephone: (601) 634-3182

Email: cofrana@ex1.wes.army.mil

Data availability: hard copy

Contact: Al Cofrancesco

Database title: **Natural Resources Management and Assessment Program (NRMAP) and National Park Service (NPS) Exotic Plants**

Agency/Organization: National Park Service (NPS)

Purpose: Relate data on natural resources to personnel needs for resource management at NPS units.

Abstract: The Natural Resource Management and Assessment Program (NRMAP) database contains

the most comprehensive data available about nonindigenous (exotic) species for NPS units. Initial data collection for the database occurred in 1993, and an update is in progress for data collected since 1996. The data were collected from 269 NPS units in 1993 and more than 300 in 1996. NPS Exotic Plants is a subset of exotic plants data from the NRMAP database. Formatted in dBase IV, it was completed by Tim Goddard, NPS, in 1996. The subset includes data for the top five exotic plant species for each park (717 records) as well as other NPS unit data (269 records). The top five exotic species data include common name, scientific name, impacted acres, and treated acres for each species. The NPS unit data include total legal, impacted, and treated acreage for each unit.

NRMAP database manager:

Bill Commins

National Park Service

1849 C St., NW

Rm 3021

Washington, DC 20240

Telephone: (202) 208-4631

Email: Bill_Commins@nps.gov

Data availability: digital media

Contact: Bill Commins

NPS Exotic Plants database manager:

Tim Goddard

National Park Service

Inventory and Monitoring

1201 Oak Ridge Dr., Suite 350

Fort Collins, CO 80525

Telephone: (970) 225-3543

Email: Tim_Goddard@nps.gov

Database title: **NPS Species List Database (NPSpecies), a subset of NRMAP**

Agency/Organization: National Park Service (NPS)

Abstract: The National Park Service (NPS) Inventory and Monitoring (I&M) Program is charged with collecting species list inventories of vascular plants, mammals, birds, reptiles, amphibians, and fish for all NPS units with significant natural resources (about 265 units). NPS resource personnel have also expressed a need to collect and maintain other species data (e.g., macroinvertebrates, insects, and fossils) that are not included in the I&M inventory. To meet this broad need, the NPSpecies database model uses a series of integrated records to document the plants, animals, fossils, other species, and related

observations that occur in park areas. The basic design of NPSpecies incorporates three levels of species data and extensive help with standard nomenclature authorities, software assistance, and additional species references. The three levels of documentation include 1) species reference documents with systematic taxonomy, 2) park species list records with voucher data, and 3) park observation records to document individual species observations. The final data model for the database will be determined by available species data, needs identified by NPS resource staff and scientists, and access security for sensitive resources. The pilot NPSpecies database is being developed via an intranet system with distributed access to the database over the Internet while maintaining individualized access, input, and edit control for users. While not intended to track exotic species, exotic species will be tagged for easy selection.

Database manager:

Joe Gregson
National Park Service
I&M Program
1201 Oak Ridge Drive, Suite 350
Fort Collins, CO 80525

Telephone: (970) 225-3559
Email: Joe_Gregson@nps.gov

Data availability: Web site under development but will have limited public access over the World Wide Web when operational; digital media (structured ASCII export files will be available from the NPS I&M Program).

Contact: Joe Gregson

Database title: Forest Service Noxious/Invasive Database

Agency/Organization: USDA Forest Service

Purpose: Relate and graphically display data on administrative reporting, inventory, and biological control for use in field offices.

Abstract: The Forest Service Noxious/Invasive Database consists of three elements: administrative and reporting, inventory, and biological control information. The administrative reporting section is part of a national corporate administrative database called INFRA. INFRA holds information on infested acres, treated acres, treatment type, planned treatment, and related information. This database holds pesticide information including chemical name rates and surfactants. INFRA is

also used to complete pesticide-use reports. It is a newer version of a longstanding (15+ years) database called FSRAMIS, and conversion to the newer version will be completed nationwide by the end of 1998.

The second portion contains inventory, site, and monitoring information and is also part of a new U.S. Forest Service database for all vegetation. Information in this portion of the database is tied to the previous portion by site identification. This portion contains detailed site information such as soils, landform, habitat type, elevation, aspect, existing vegetation, species, cover, etc. Potential fields available to the user are extensive. All data elements in the noxious weed portion of the database are part of the larger vegetation database, with the exception of the option of using the Greater Yellowstone area noxious weed cover classes. Noxious weed monitoring information is also contained in this portion of the database.

The third portion, still under development, contains information on biological control. It contains information on species released and relevant release information such as temperature, wind speed, and insects present. It also contains monitoring information on insect density and spread. Linked to the other portions of the database through site identification, information is not duplicated within the database structure. Hence, site information on a biological control release site is contained in the inventory portion of the database. All information in the database can be graphically displayed in ARC INFO or ARC View through the site identification or other data elements. The database allows the flexibility to either have acres computed by the geographic information system or be entered from field data. All portions of the database hold successive year information so changes in infestation levels and treatments can be displayed. All portions of the database are designed for field office use. It is currently envisioned that little of the data contained in the database will be used at the national level. At the national level, summary data of infested acres (by species) and treated acres will be the primary information collected.

Database managers:

Rita Beard
U.S. Forest Service
Rocky Mountain Forest and Experiment Station
240 W. Prospect Road
Fort Collins, CO 80526

Telephone: (970) 498-1715

James E. Zimmerman, computer specialist

Telephone: (202) 205-1412

Data availability: digital media and hard copy; computer system currently in transition; anticipate only summary information at the national or regional level for the next year.

Digital media contact: Rita Beard

Hard copy contact: James Zimmerman

Database title: Forest Health Monitoring Program

Agency/Organization: USDA Forest Service

Purpose: Annually monitor and report on conditions, changes, and trends in U.S. forests for sustainability.

Abstract: The Forest Health Monitoring (FHM) program is a multi-agency, cooperative effort to determine the status, changes, and trends in all forest ecosystems in the United States on an annual basis. The partners in the FHM program include the USDA Forest Service (State and Private Forestry, Research, and the National Forest System), State Foresters, the Department of the Interior's Bureau of Land Management, and the U.S. Environmental Protection Agency. The USDA Forest Service directs the FHM program, in partnership with States and the Bureau of Land Management. The FHM program is designed to evaluate the condition, changes, and trends in all U.S. forests on an annual basis; evaluate the causes of poor forest condition; and evaluate key ecosystem components and processes to better understand how forest ecosystems function. The FHM program will help the United States and participating countries address forest sustainability because the indicators used in FHM regional monitoring are based on productivity, diversity, vitality, soil conservation, and carbon sequestration. The FHM program has four major components: detection monitoring (national or regional monitoring); evaluation monitoring (intensified monitoring or analysis in problem areas); intensive site ecosystem monitoring (monitoring to understand processes and improve predictive capabilities); and research on monitoring techniques (research to improve monitoring techniques). Detection monitoring data is collected on personal data recorders with on-site edit checks, and after post-season edits, resides in an Oracle database that can be accessed from personal computers at remote locations.

Database managers:

Chuck Liff

Telephone: (702) 798-2222

Ken Stolte

Forest Service Lab

USDA Forest Service

Research Triangle Park, NC 27709

Telephone: (919) 549-4020

Email: kstolte@rtpmail.emapfhn.gov

Data availability: hard copy

Contact: Chuck Liff

Database title: National Agricultural Pest Information System (NAPIS)

Agency/Organization: USDA, Animal and Plant Health Inspection Service (APHIS)

Purpose: Provide survey data for plant pests in the United States.

Abstract: National Agricultural Pest Information System (NAPIS) provides plant pest survey data on a national scale in conjunction with the Cooperative Agricultural Pest Survey (CAPS). Access to NAPIS has been provided to each state's land grant university system, department of agriculture, and APHIS headquarters for APHIS PPQ in each state and in Puerto Rico. Other USDA agencies also have access to NAPIS. CAPS members and other users may access NAPIS via direct dial telephone service or Internet. Certain USDA staff members can reach NAPIS via the PPQ X.25 network.

NAPIS has replaced hardcopy publications which formerly reported survey results. The Cooperative Plant Pest Report, the Cooperative Economic Insect Report, and the Plant Disease Report are no longer published by USDA. Rather, data which had previously been reported to these publications can be entered into NAPIS. NAPIS can provide data in coded or plain-language downloads and can generate a variety of reports. Specialized reports can be created for projects or other needs.

All NAPIS data are referenced to a state and county, and each record may have point-location referencing. NAPIS data downloads can be used with standard geographic information system software to create maps and analytical reports.

NAPIS contains data which describe the results of a wide range of plant pest surveys conducted throughout the United States. Emphasis is given to surveys for exotic pests, pests which may impact

export of U.S. agricultural products and PPQ cooperative program pests and biological control agents. CAPS projects facilitate the collection and management of data on these subjects.

Database managers:

Dave McNeal

USDA APHIS PPQ

4700 River Road Unit 134

Riverdale, MD 20737

Telephone: (301) 734-8247

Email: dmcneal@aphis.usda.gov

Jim Pheasant

NAPIS Hotline, User Services

CERIS, Purdue University

Telephone: (765) 494-9853

Email: pheasant@ceris.purdue.edu

Data availability: Web site at <http://www.ceris.purdue.edu/napis>;

digital media and hard copy

Contact: state survey coordinators

NAPIS Cooperative Agricultural Pest Survey State Survey Coordinators, 08-22-97

Northeastern Region

State	Coordinator	City	Telephone
Connecticut	Donna Ellis	Storrs	(203) 486-6448
Delaware	Randy Ciurlino	Dover	(302) 739-4811
Illinois	Charles Helm	Champaign	(217) 333-1005
Indiana	Chris Oseto	West Lafayette	(765) 494-4554
Massachusetts	Craig Hollingsworth	Amherst	(413) 545-1055
Maryland	Dick Bean	Annapolis	(410) 841-2743
Maine	Ron Mack	Orono	(207) 581-2967
Michigan	Raj Sitaraman	Lansing	(517) 373-1087
Minnesota	Neville Wilson	Minneapolis	(612) 296-6509
New Hampshire	John Weaver	Durham	(603) 862-1737
New Jersey	Tom Denholm	Trenton	(609) 292-5440
New York	Janet Knodel	Geneva	(315) 787-2207
Ohio	Bruce Easley	Columbus	(614) 292-8358
Pennsylvania	Nancy Richwine	Harrisburg	(717) 787-4843
Rhode Island	Lisa Tewksbury	Kingston	(401) 874-2750
Virginia	Eric Day	Blacksburg	(540) 231-4899
Vermont	Jon Turmel	Montpelier	(802) 828-2431
Wisconsin	Melody Walker	Madison	(608) 224-4595
West Virginia	Tim Brown	Charleston	(304) 558-2212

Southeastern Region

State	Coordinator	City	Telephone
Alabama	Wheeler Foshee	Auburn	(334) 844-5509
Florida	Richard Sprenkel	Quincy	(904) 875-7128
Georgia	Keith Douce	Tifton	(912) 386-3424
Kentucky	Pat Dillon	Lexington	(606) 257-3571
Mississippi	Ed Dyess	Mississippi State	(601) 325-7771
North Carolina	Ken Ahlstrom	Raleigh	(919) 733-3610
Puerto Rico	Nilda Perez	Santurce	(787) 724-4627
South Carolina	Clyde Gorsuch	Clemson	(864) 656-5043
Tennessee	Elizabeth Long	Knoxville	(423) 974-7138

Central Region

State	Coordinator	City	Telephone
Arkansas	Vacant	n/a	n/a
Iowa	John Haanstad	Des Moines	(515) 242-5180
Kansas	Tom Sim	Topeka	(785) 296-2263
Louisiana	Bill Spitzer	Baton Rouge	(504) 389-0201
Missouri	George Smith	Columbia	(573) 882-3054
Nebraska	Steve Johnson	Lincoln	(402) 471-2394
North Dakota	Dave Nelson	Bismark	(701) 328-4765
Oklahoma	Gerritt Cuperus	Stillwater	(405) 744-5531
South Dakota	Ron Flakus	Pierre	(605) 733-3796
Texas	George Nash	Austin	(512) 916-5241

Western Region

State	Coordinator	City	Telephone
Alaska	Jenifer McBeath	Fairbanks	(907) 474-7188
Arizona	Roger Huber	Tucson	(520) 621-1523
California	Ray Gill	Sacramento	(916) 262-1100
Colorado	Louis Bjostad	Fort Collins	(970) 491-5987
Hawaii	Ron Heu	Honolulu	(808) 973-9528
Idaho	Mike Cooper	Boise	(208) 332-8620
Montana	Diana Cooksey	Bozeman	(406) 994-5684
Nevada	Robert Gronowski	Reno	(702) 688-1180
New Mexico	Robert Cain	Santa Fe	(505) 827-5833
Oregon	Kathleen Johnson	Salem	(503) 986-4662
Utah	Jay Karren	Logan	(801) 797-2514
Washington	Linda Polzin	Olympia	(360) 753-2228
Wyoming	David Kazmer	Laramie	(307) 766-5199

Database title: The Plants Database

Agency/Organization: USDA, Natural Resources Conservation Service (NRCS), National Plant Data Center (NPDC)

Purpose: Provide information for natural resource conservation for NRCS, its clients, cooperators, and the public.

Abstract: The PLANTS database grew out of the National List of Scientific Plant Names. PLANTS is a dynamic database accessible via the World Wide Web. PLANTS designates species as either native or introduced and encompasses the plant information (taxonomy, distribution, growth factors, crops, images, and other plant attributes) required by NRCS natural resource applications for providing natural resource conservation assistance to clients. The information available on the PLANTS web site continues to grow and be

revised. The National Plant Data Center cooperates with many contributors in the development of PLANTS and other applications including the Biota of North America Program, Flora of North America, International Organization for Plant Information, Alcorn State University, North Carolina A&T University, Missouri Botanical Garden, Santa Barbara Botanic Garden, Royal Botanic Garden at Edinburgh, Utah State University, University of Wyoming, University of Texas at Austin, Louisiana State University, Northeastern Louisiana University, University of Nebraska, Southern Illinois University at Carbondale, and Botanischer Garten-Berlin. The NRCS is also cooperating with the USGS Biological Resources Division and others to incorporate and link to information on noxious weeds to assist our 3,000 field offices with additional information.

Director:

J. Scott Peterson
P.O. Box 74490
Baton Rouge, LA 70874

Telephone: (504) 775-6280
Email: speterson@npdc.nrcs.usda.gov

Database manager:

Mark Skinner
P.O. Box 74490
Baton Rouge, LA 70874

Telephone: (504) 775-6280
Email: mskinner@npdc.nrcs.usda.gov

Data availability: Web site at <http://plants.usda.gov>

Contact: Mark Skinner

Database title: Alien Species Databases of the HEAR Project

Agency/Organization: USGS, Hawaiian Ecosystems at Risk (HEAR) Project

Purpose: Provide resources to natural resource managers in Hawaii to aid fight against alien species statewide.

Abstract: The Hawaiian Ecosystems at Risk (HEAR) project, a USGS Biological Resources Division Ecosystem Initiative project, is an effort to provide resources (technology, methods, and information) to resource managers in Hawaii to aid in the fight against invasive alien species statewide. The role of the project is initiating coordinated, multiagency control and eradication actions by:

- (1) compiling the best-available existing spatial distribution information on alien species in Hawaii;
- (2) identifying those alien species with the most harmful effects on other valued species, natural communities, or agricultural crops;
- (3) identifying a subset of the most harmful alien species for which cost-effective control methods already exist, and for which the population size and/or spatial distribution is small or localized enough for control to be feasible;
- (4) making findings available to cooperating agencies so as to assist them in setting priorities, allocating resources, and making decisions for control actions;
- (5) facilitating full utilization of the existing data, as well as gathering of new data to fill the gaps;

(6) developing standardized, user-friendly data management tools.

Database manager:

Philip A. Thomas
Hawaiian Ecosystems at Risk Project
3190 Maile Way, Rm. 409
St. John, Honolulu, HI 96822

Telephone: (808) 572-9306 x 53233
Email: thomasp@maui.com

Data availability: Web site at <http://www.hear.org>; digital media and hard copy

Contact: Philip Thomas

Database title: Nonindigenous Aquatic Species Program

Agency/Organization: USGS Biological Resources Division

Purpose: Documents status and distribution of nonindigenous species introduced to U.S. waters.

Abstract: Primarily in response to the introduction of zebra mussels into the Great Lakes, Congress enacted the Nonindigenous Aquatic Species Prevention and Control Act of 1990. The major focus of the Act was to set up a framework to monitor and control nonindigenous aquatic species and to reduce the risk of their unintentional introductions. A core element of this framework was to create an Information Service to provide timely, reliable data about the presence and distribution of introduced aquatic species. In 1993, the Nonindigenous Aquatic Species Program was established at the USGS Biological Resources Division research facility in Gainesville, Florida. This public access information system includes maps, fact sheets, data sets, custom reports, and other related information regarding aquatic introductions reported since 1850. Of concern are not only exotic, foreign species but also native organisms that have been transported outside of their natural ranges. The current on-line database contains over 35,000 geographically referenced accounts of over 680 species of fish, mammals, amphibians, reptiles, tunicates, bryozoans, sponges, coelenterates, annelids, mollusks, crustaceans, diseases, parasites, and plants. The addition of plants is a new initiative that accounts for introductions of aquatic monocot, dicot, fern, and alga species. Records of freshwater as well as marine organisms are collected. Information on each introduction is obtained from the literature, state and Federal agency programs, universities, museums, and on-line databases. A web site

reporting form is especially useful for receiving new reports. Database records include fields for information on taxonomy, locality, method of collection, origin, physical parameters, habitat, and status of the introduction. Each record is georeferenced to the finest USGS hydrologic unit possible. On-line access to the data set is available through the Internet. Users can perform state or hydrologic basin queries, obtain fact sheets, and get distribution maps showing native and introduced ranges. Factsheets include information relating to the taxonomy, identification, native and introduced ranges, method of introduction, status, and known impacts of each species.

Director:

Charles Boydston
USGS Biological Resources Division
Florida Caribbean Science Center
7920 N.W. 71st St.
Gainesville, FL 32653

Database manager (Plants):

Colette Jacono
Florida Caribbean Science Center
7920 NW 71st St.
Gainesville, FL 32653-3071

Telephone: (352) 378-8181
Email: nas@fcsc.er.usgs.gov

Data availability: Web site at <http://nas.er.usgs.gov>; digital media and hard copy

Digital media contact: Charles Boydston, database director

Hard copy contact: Colette Jacono

Database title: The Exotics Map Database

Agency/Organization: USGS Biological Resources Division, Colorado Plateau Field Station

Purpose: Use Internet mapserver technology to help land managers integrate exotic plant management in the arid Southwest.

Abstract: The Colorado Plateau Field Station (CPFS) is developing a prototype procedure for the collection, compilation, and distribution of information on exotic plant species. Colorado Plateau collaborators are collecting field data on exotic plant species on the land they administer. Initially these data were centered on a standardized data form and then entered into an Exotics Data Entry Program. The CPFS compiles the data into the Exotics Map Database, a digital database that includes species name, georeferencing information, and estimates of infestation size. The

data is used to generate a GIS coverage which is displayed and accessed through the World Wide Web using map server technology. We anticipate that the map server technology may provide the most interactive means to distribute the Exotics Map Database.

Database manager:

Kathryn Thomas
Colorado Plateau Field Station
P.O. Box 5614
Flagstaff, Arizona 86011

Telephone: (520) 556-7466, x235

Email: kat@nbs.nau.edu

Data availability: Web site at <http://www.usgs.nau.edu/swemp/>; digital media

Digital media contact:

Elena Deshler, project coordinator
Colorado Plateau Field Station
P.O. Box 5614
Flagstaff, Arizona 86011

Telephone: (520) 556-7468

Email: edeshler@usgs.nau.edu

Database title: Noxious Weed Information System (NWIS)

Agency/Organization: California Department of Food and Agriculture, Integrated Pest Control Branch

Purpose: Use FTP exchange and MapInfo GIS to help California field biologists inventory noxious weed infestations and track eradications.

Abstract: The California Department of Food and Agriculture is developing a Noxious Weed Information System (NWIS) to coordinate information on noxious weed control in California. The NWIS is an integrated central data clearinghouse, anchored by two database systems. One database is a public forum where governmental land managers can describe their weed control projects and look for other persons with similar concerns. It is also intended as a source of information on weed biology and control. This system will be available through a World Wide Web site being developed at the Information Center for the Environment at University of California, Davis. The second database system is intended for weed biologists within the state and counties and will help them inventory and map infestations of noxious weeds and track eradication efforts. Each state biologist and county will have a stand-alone copy of the database at their

field sites. The field copies of the database coordinate with a central database through FTP exchanges over the Internet. A MapInfo GIS system accepts GPS positional information on weed populations and controls activities and provides maps of infestations.

Database managers:

Patrick Akers or Steve Schoenig
California Department of Food and Agriculture
Integrated Pest Control Branch
1220 N St., Room A-357
Sacramento, CA 95814

Telephone: (916) 654-0768

Email: pakers@cdfa.ca.gov
sschoeni@cdfa.ca.gov

Data availability: Web site at <http://endeavor.des.ucdavis.edu/weeds>

Database title: INVADERS Database Project

Agency/Organization: University of Montana,
Division of Biological Sciences

Purpose: Source of distribution records for exotic and weedy native plants in the northwest states.

Abstract: The INVADERS Database Release 6.4 contains 8,780 scientific names (including synonyms) for 5,918 exotic and native plant species reported in Washington, Oregon, Idaho, Montana, and Wyoming. Nomenclature generally follows Hitchcock and Cronquist (1973). Legal status, common names, family, life form, and duration of exotics are available. There are 80,024 verifiable distribution records for 3,022 species, including 890 exotic species of North America for the years between 1875 to 1996. Seventy-five percent of the distribution data are for exotics. Fields include collector, county, place name, and date. Geo-coordinates are available for some records. Another field contains miscellaneous data on severity or size of weed infestation, associated vegetation, environmental and management factors, etc. Primary sources are the herbaria at Washington State University, Oregon State University, Montana State University, University of Montana, and University of Idaho; Extension Service identification records for Washington, Oregon, Idaho, and Montana; U.S. Forest Service Region 1 ECODATA, and the Oregon, Montana, Washington, and Wyoming Departments of Agriculture. These data are supplemented with records from several other agency, university and literature sources, including U.S. Forest Service Region 6 Ecology Plot data, Rocky Mountain

Herbarium (not completed), Montana Natural Heritage Program, Montana Weed Seed Free Forage Program, and records received and verified by Peter M. Rice. Custom INVADERS software can be used to generate distribution maps, time lapse maps, expansion rate curves, and species lists for counties or groups of counties. It takes less than 20 minutes to learn the custom software. The software can be adapted easily for other groups of states.

Database manager:

Peter M. Rice or J. Christopher Toney
University of Montana, Biology Division
Missoula, MT 59812

Telephone: (406) 243-2671

Email: biopmr@selway.umt.edu
ctoney@selway.umt.edu

Data availability: Web site at <http://invader.dbs.umt.edu>; digital media

Contact: Peter Rice

Database title: ROADVEG - Maintenance Division, Roadside Vegetation

Agency/Organization: Utah Department of
Transportation (UDOT)

Purpose: Database encoding land and vegetation attributes for roadsides, adjacent lands, and context landscapes.

Abstract: The Utah Department of Transportation, in collaboration with Utah State University, developed a relational database and GIS, dubbed ROADVEG, that encodes land and vegetation attributes for roadsides, adjacent lands, and context landscapes. Road segment data constitute the basic nomenclatural and spatial references to the UDOT region number, route number, travel direction, from and to mile-markers, and survey date for the road segments surveyed. Five fields of coded relational data assign county, ecoregion, watershed, landform, and wetlands attributes to each variable-length road segment. Seven fields of coded relational data form an abstract of (1) the vegetation types along the right-of-way and in the nearby and greater landscape context; (2) the ranked similarity between the right-of-way vegetation and the context vegetation; and (3) the structure and general composition of the three primary vegetational layers—trees, shrubs, and herbs. Relational tables also provide vegetational composition for encoded vegetation types. Scientific names, common names, families,

origins, and management status as a noxious weed, invasive species, or special status species, are also related to vegetation types for all plants encountered. Via the ArcView GIS display, users are able to query and display various vegetational attributes as needed. To date, about 1,360 linear miles of Utah roadways have been field-assessed and scored. As funding becomes available, the remainder of the state's major roadways will be inventoried.

Database manager:

Ira Bickford

Utah Department of Transportation

4501 South 2700 West

Salt Lake City, UT 84119

Telephone: (801) 965-4119

Email: srdomain.src0f01.ibickfor@state.ut.us

Data availability: digital media

Contact: Ira Bickford

Database title: Biota of North America Program

Agency/Organization: North Carolina Botanical Garden, University of North Carolina at Chapel Hill

Purpose: Develop unified system for assessing North American biota; use digital floristic synthesis for assessing exotic and weed plant distributions.

Abstract: The Biota of North America Program (BONAP) of the North Carolina Botanical Garden was founded in 1969 by Dr. John Kartesz, with the goal of developing a unified system for assessing the North American biota. BONAP works closely with federal government agencies, private organizations, and universities, including the Natural Resources Conservation Service, the National Park Service, the U.S. Fish and Wildlife Service, The Nature Conservancy, the University of California at Berkeley, and many others, to develop and provide nomenclatural, taxonomic, and phytogeographic data. BONAP's nomenclatural data, published in 1994 in the second edition of a two-volume work, "A Synonymized Checklist of the Vascular Flora of the United States, Canada, and Greenland," and updated annually, represents the most comprehensive assessment of the nomenclature and taxonomy of the North American vascular flora (north of Mexico) thus far produced. In addition to nomenclature and taxonomy, BONAP maintains an exhaustive assessment of phytogeographic distributions for

some 36,000 North American plant taxa occurring north of Mexico. For some of the 500,000 state- or equivalent-level distributional records, a bibliographic reference and/or voucher documentation is maintained. County-level data are also maintained for all vascular plants found in approximately 36 U.S. states, with the goal of completing the county-level data for all 50 states within the next few years. Several thousand biological attribute fields, such as rarity, weediness, nativity, insectivory, plant habit, habitat, duration, biogeography, hardiness, medical value, and horticultural values, are also maintained by BONAP for each of the taxa treated, making the database one of the largest in existence.

Early this fall, BONAP will complete its 1997 Floristic Synthesis, a series of digital products intended to integrate the most fundamental components of its database, including the fully synonymized nomenclatural data, state- or equivalent-level distribution data, common names, and 45 biological attribute fields, for all 36,000 taxa, into a single package. The user-friendly system will permit complicated Boolean operations to be performed, via a mouse, while displaying the results graphically.

Database director:

John Kartesz

Biota of North America Program

University of North Carolina, Department of Biology

Chapel Hill, NC 27599-3280

Telephone: (919) 962-0578

Email: jkartesz@jkartesz.bio.unc.edu

Database manager:

Amy Farstad

Biota of North America Program

University of North Carolina, Department of Biology

Chapel Hill, NC 27599-3280

Telephone: (919) 962-0578

Email: afarstad.coker@mhs.unc.edu

Data availability: Web site at <http://trident.ftc.nrcs.usda.gov/plants/>; digital media or hard copy

Contact: John Kartesz

Database title: Man and the Biosphere Flora (MABFlora)

Agency/Organization: University of California, Davis

Purpose: Computer program provides interface for biologists to input occurrence records and create reports on MAB reserves.

Abstract: Man and the Biosphere Flora (MABFlora) is a computer program which provides a graphical user interface for biologists to input records of inventory and monitoring activities of vascular plants in MAB Biosphere Reserves and other protected areas. MABFlora contains data dictionaries (peer-reviewed, published nomenclatures) of species names and enables users to make selections from menus of choices provided by the program. Several nomenclature sources are used: the version of MABFlora for North America uses a modified version of the USDA PLANTS database, a version for Biosphere Reserves in California uses the Jepson Manual, a version for western Europe uses the Flora European database, and a version for Russia uses the Vascular Plants of Russia. It also enables users to create preformatted reports and to output records in the database in either ASCII text or dBase III compatible flat files.

Database director:
James F. Quinn
Biodiversity Group
Information Center for the Environment
Division of Environmental Studies
University of California
Davis, CA 95616

Telephone: (916) 752-1768
Email: jfquinn@ucdavis.edu

Database manager:
Robert J. Meese
Biodiversity Group
Information Center for the Environment
Division of Environmental Studies
University of California, Davis, CA 95616

Telephone: (916) 752-1768
Email: rjmeese@ucdavis.edu

Data availability: Web site at <http://ice.ucdavis.edu/MAB>; digital media and hard copy

Contact: Robert Meese

Database title: Florida Exotic Pest Plant Council (FLEPPC) Invasive Plant Database

Agency/Organization: Florida Exotic Pest Plant Council

Purpose: Capture location of invasive exotic plants in Florida to document impacts, identify habitat

and research needs, and justify policy and control strategies.

Abstract: In 1994, the Florida Exotic Pest Plant Council identified the need for the development of a statewide database to capture the location of recognized invasive exotic plants in the state. The database, which has received data from federal, state, and local government resource managers throughout the state, has grown to over 333 site locations and continues to expand at a rate of approximately 20 new sitings per month.

The database has been used for a number of purposes, including documenting site locations where invasive plants are impacting endangered and threatened plant and animal species, developing local government prohibitions of specific plants identified as threats to local natural areas, assisting in identification of research needs, providing input about types of habitats invaded by specific weeds and potential state distribution, and justifying allocation of control dollars for specific targeted weeds.

Database manager:

Greg Jubinsky
Rt. 1 Box 3465
Havanna, FL 32333

Telephone: (850) 539-9681

Email: jubinsky_g@epic6.dep.state.fl.us

Data availability: hard copy

Contact: Greg Jubinsky

Database title: Exotic Species Database

Agency/Organization: The Nature Conservancy

Purpose: Assess weed problems on preserves stewarded by The Nature Conservancy and formulate control strategies.

Abstract: In 1992 and again in 1995, the stewardship offices in The Nature Conservancy responded to weed surveys. In 1995, 124 offices responded, representing information from 45 states (3.3 million acres of preserves). Approximately 195 weed species were reported, and 86% of the land managers cited exotic species as being one of the top ten problems facing them.

The database consists of information on the weed species present, their distribution, and comments from the managers on their impacts and the control efforts used against the plants.

Database manager:

Barry Meyers-Rice

The Nature Conservancy
Wildland Weeds Management and Research
University of California
Davis, CA 95616

Telephone: (530) 754-8891
Email: bazza@ucdavis.edu

Data availability: Web site under development

**Database title: Florida Natural Areas Inventory
Biological Conservation Database**

Agency/Organization: Florida Natural Areas
Inventory

Purpose: Track information on species, managed
areas, and conservation areas in Florida.

Abstract: The Florida Natural Areas Inventory
(FNAI) was established in 1981 as a cooperative
effort of the Department of Environmental
Protection and the Conservation Science Division
of The Nature Conservancy headquarters, a
national, nonprofit conservation organization
dedicated to the preservation of natural diversity.

The FNAI Biological Conservation Database
(BCD) currently houses nearly 25,000 data
records for rare plant and animal species and
exemplary natural communities for the state of
Florida, incorporating the most recent data
available from a variety of sources. Retrieval
capabilities allow access to data on species and
natural communities by a number of criteria,
including location, natural community type,
species name, and listing status and rank. Detailed
information about the status, condition, and
management requirements of rare species and
natural community types is also available. The
database is a flexible system capable of producing
information in a variety of formats, including text,
data, and GIS files, that can be accessed by a
broad spectrum of users including Federal and
state agencies, local governments, consulting
firms, research organizations, private conservation
groups, corporations, and private citizens. The

BCD also tracks information about managed areas
and other conservation areas in the State of
Florida. Files on managed and conservation areas
include information on location, size, resources,
and management status of the area. FNAI's
standardized methodology allows for the compari-
son of natural resources at the local, regional, and
statewide level. Future plans include the addition
of nonindigenous species to the BCD (L. Chafin,
senior botanist, Florida Natural Areas Inventory,
personal communication, Sept. 1997).

GIS data files for rare species and natural commu-
nity locations, managed/conservation areas, and
Areas of Conservation Interest are available with
associated attributes. Files are available in ARC/
INFO 6.1.1, ver 7.0.3 (Unix), Export format. All
coverages are in UTM ZONE 17, NAD27. Non-
attribute files include hydrography, watersheds,
highways and roads, township range and section,
counties, and LANDSAT land cover.

Senior Botanist:

Linda Chafin
Florida Natural Areas Inventory
1018 Thomasville Rd., Suite 200C
Tallahassee, FL 32303

Telephone: (850) 224-8207
Email: lchafin@fnai.org

Database manager:

Lance Peterson
Florida Natural Areas Inventory
1018 Thomasville Rd., Suite 200C
Tallahassee, FL 32303

Telephone: (850) 224-8207
Email: lpeterson@fnai.org

Data availability: Web site at [http://www.fnai.org/
index.htm](http://www.fnai.org/index.htm); digital media and hard copy

Contact: Lance Peterson

(No fee for nonprofit and /or conservation
organizations. \$100/hr fee to profit making
organizations)

The following items are not listed in the tables of distribution databases. The Bureau of Land Management does not have a national database of weed locational information. The Aquatic and Wetland Plant Information Retrieval System at the University of Florida Center for Aquatic Plants is a bibliographic database and does not include distribution. Both agencies attended the workshop.

Database title: Bureau of Land Management Weed Information

Agency/Organization: Bureau of Land Management (BLM)

Abstract: Currently, there is no national database for BLM offices to put their data on weed locational information. However, a national database for special status species tracking, which may be modified to hold weed locational and weed treatment information exists. BLM is cooperating with the states of Montana and California on statewide databases and in New Mexico with the USGS Biological Resources Division out of Flagstaff, Arizona. Most states do not have a statewide database, but there is considerable cooperation at the county level for mapping of invasive species.

Contact:

Carol Spurrier
Bureau of Land Management
Colorado State Office (CO 932),
2850 Youngfield St.
Lakewood, CO 80215-7076

Telephone: (303) 239-3725
Email: cspurrier@co.blm.gov

Database title: Aquatic and Wetland Plant Information Retrieval System

Agency/Organization: University of Florida, Center for Aquatic and Invasive Plants

Purpose: A bibliographic database about freshwater and wetland plants.

Abstract: The Aquatic Plant Information Retrieval System (APIRS) maintains a computerized bibliographic database devoted to freshwater aquatic and wetland plants. The database includes citations for more than 44,000 research articles, books, and reports about aquatic plant ecology, physiology, utilization, and control. Items in many languages dating back to the 18th century are in this inclusive database. During the past 16 years, it has been used by thousands of researchers, regulators, managers, teachers, and students in more than 80 countries. The entire database is online and can be accessed directly from the Center for Aquatic and Invasive Plants web site.

Database managers:

Victor Ramey
Karen Brown
Center for Aquatic Plants, Information Center
University of Florida
7922 N.W. 71st St.
Gainesville, FL 32653

Telephone: (352) 392-1799
Email: varamey@nervm.nerdc.ufl.edu
kpb@GNV.IFAS.EDU

Data availability: Web site at <http://aquat1.ifas.ufl.edu>; hard copy

Hard copy contact: Karen Brown

List of Participants

Patrick Akers	California Department of Food and Agriculture, Integrated Pest Control Branch, Sacramento, CA
Amy Benson	USGS Biological Resources Division, Florida Caribbean Science Center, Gainesville, FL
Charles Boydston	USGS Biological Resources Division, Florida Caribbean Science Center, Gainesville, FL
Al Cofrancesco	USACE, WES, Vicksburg, MS
Joe Dineen	Smithsonian Research Center, Marine Station, Fort Pierce, FL
Pam Fuller	USGS Biological Resources Division, Florida Caribbean Science Center, Gainesville, FL
William Gregg	USGS Biological Resources Division, Reston, VA
Joe Gregson	NPS, Inventory and Monitoring Program, Fort Collins, CO
Russ Hall	USGS Biological Resources Division, Florida Caribbean Science Center, Gainesville, FL
Colette Jacono	USGS Biological Resources Division, Florida Caribbean Science Center, Gainesville, FL
John Kartesz	University of North Carolina, Department of Biology, Biota of North America Program, Chapel Hill, NC
Carol Lippencott	University of Florida, Department of Botany, Gainesville, FL
David McNeal	USDA, Animal and Plant Health Inspection Service, Riverdale, MD
Levester Pendergrass	USDA Forest Service, Range Management/Botany, Atlanta, GA
Victor Ramey	University of Florida, Center for Aquatic Plants, Information Center, Gainesville, FL
Mark Skinner	USDA Natural Resources and Conservation Service, National Plant Data Center, Baton Rouge, LA
Carol Spurrier	BLM, Colorado State Office, Lakewood, CO
Tom Stohlgren	USGS Biological Resources Division, Midcontinent Ecological Science Center, Fort Collins, CO
Ken Stolte	USDA Forest Service, Forest Service Lab, Research Triangle Park, NC
Kathryn Thomas	USGS Biological Resources Division, Colorado Plateau Field Station, Flagstaff, AZ
Philip Thomas	USGS Biological Resources Division, Hawaiian Ecosystems at Risk Project, Honolulu, HI
J. Christopher Toney	University of Montana, Biology Division, Missoula, MT
Randy Westbrook	USDA, Animal and Plant Health Inspection Service, Whiteville, NC (on detail to USGS Biological Resources Division, Reston, VA)